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AIR UNIVERSITY

A MODEL FOR A SINGLE UNMANNED AIRCRAFT SYSTEMS (UAS) PROGRAM OFFICE MANAGING JOINT ISR CAPABILITIES

by

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ABSTRACT

The purpose of this research paper is to answer how a single management office could provide greater agility for unmanned aircraft systems (UAS); supporting Joint concepts, Joint operations and Joint interoperability.

Three Alternatives were selected, Status Quo with agile methodology implemented, Alternative Two is a single Service managing the medium to high-altitude UAS fleet, and Alternative Three is a new Unified Command. The problem/solution framework was used, along with mixed methods for the data research as it combines both quantitative and qualitative data to answer the problem. The criteria selected are key agile principles and were used to compare the alternatives against the current state to determine if using agile principles has advantages. Office consolidation savings are shown separately to compare the current state with managing the UAS fleet under a single office in Alternative Two and Three.

Analysis showed that implementing the agile criteria would greatly improve efficiency in all three alternatives. The cost savings from office consolidation are significant enough to recommend portfolio management of the UAS fleet versus individual Service management.

The Unified Command option, Alternative Three, has the additional benefits of streamlined acquisition, maintaining the warfighter perspective and meeting the challenges the UAS portfolio faces today as well as tomorrow. Therefore, this was the recommended option and the way to keep up with the growing demand for ISR and to stay ahead of our enemies.

INTRODUCTION

Overview of the Study

Chairman of the Joint Chiefs of Staff, General Martin E Dempsey said that, "To achieve an effective, efficient ISR [Intelligence, Surveillance and Reconnaissance] Joint Force for 2020, it is critical to pinpoint where and how ISR can be improved, not just in capability but in acquisition, development, force management, and across the full spectrum of operations."[1] General Dempsey put forth a challenge to look critically at ISR business processes, as well as capabilities, in order to achieve the ISR Joint Force needed to maintain United States (US) military advantage over our enemies. This researcher accepts Gen Dempsey's challenge by proposing an alternative to the current duplicative practice of each Service maintaining their own program office to manage the ever growing demand of medium and high altitude UAS aircraft. Agile program management criteria are used to evaluate three alternatives. Based upon this evaluation, recommendations are provided to achieve a more effective, efficient ISR organizational model to support the US Joint force for 2020.

Nature of the Problem

Since 2005, the United States Government Accountability Office (GAO) has cited the Service-specific UAS fleet management structure as inefficient, while advocating for a single entity to integrate cross-cutting program issues for the portfolio.[2] Deficiencies resulting from this Service-specific management of the UAS fleet, are the lack of enterprise perspective, duplication of capabilities, lack of standardized configuration, lagging fleet modernization, lack of standardized process to resolve fleet deficiencies, and not keeping up with operational requirements (demand). Additionally, the GAO pointed out that, in spite of the increased demand for ISR assets, the only new major acquisition of UAS across the Future Years

Defense Program (FYDP) was for the Navy's MQ-25A Stingray and flagged it as an indicator of an inability of the programs to keep up with demand.[3]

In response to the GAO's observation of inefficiency within the UAS community, the Department of Defense (DoD) stood up a Task Force on 13 September 2007 with DEPSECDEF Memo 14667-7[4] to coordinate interoperability activities and to gain efficiencies across the Services via the Office of the Secretary of Defense (OSD) UAS Airspace Integration (AI) Integrated Product Team (IPT). The IPT coordinates Service updates to the OSD Unmanned Systems Roadmap and other products that influence DoD-wide UAS acquisition and technology development decisions associated with airspace integration. This IPT involvement was meant to ensure a Joint perspective by identifying issues, engaging all stakeholders, finding solutions, advocating for policy, and maintaining a roadmap.[5]

The Task Force has made some gains; however, no consistent gains have been achieved in either efficiency or agility across the Services. To the contrary, the Task Force has increased costs to the DoD and has added layers to decision-making which hinders program agility. Even with the IPTs and Advisory Groups, the Task Force has no direct decision authority; it can merely encourage participation, which is the reason for the mixed results in program improvements.[6] An example of the Task Force's lack of authority is that only the Navy has complied with directives requiring the use of an open systems approach while they were ignored by the other Services. Even if Task Force directives were consistently complied with across all of the Services, there would still be the duplication of program management tasks being performed across all of the program offices versus the efficiency of being consolidated.[7]

In addition to the GAO, the ISR community also advocates for a single entity to manage UAS assets. At the Cross Domain Dominance conference in 2006,[8] the Air Force ISR Agency proposed that a DoD Executive Agent for medium and high altitude UAS could establish standards across the enterprise that would make acquisition more effective and efficient. One of the messages from this conference and one that runs throughout other strategic documents was that ISR is so central to operations; that it IS operations as well as being needed for other areas whether it is planning, programming, or acquisition. Regardless of what Service or platform acquires the data, ISR crosses all domains.[9] Because of the universal nature of the data delivered, the ISR community believes that a single management office would offer a stronger voice to advocate for the UAS community and would provide more integrated procedures. Furthermore, there would be greater alignment and consistency in sharing information, interfaces, and training.

The *National Military Strategy*,[10] identifies the need for integrated operations to enable Joint Force capability, as detailed in *Capstone Concept for Joint Operations: Joint Force 2020*.[11] Data from UAS activity across the Services is key to accomplishing all eight components to this Capstone Concept. Does the current DoD approach to UAS management meet the intent of this Joint vision? With the high demand, cross-domain, cross-Service, platform agnostic nature of ISR, this research answers the question of how a single management entity could agilely support Joint concepts, operations and interoperability. Should the Services continue to manage their unique programs? Should UAS be managed by one of the Services or become a Unified Command such as United States Special Operations Command (USSOCOM)? What organizational structure best meets the demands of the

Unmanned Systems Integrated Roadmap FY2013-2038[12] and Joint Publication 2-0;[13] while speeding up delivery, increasing operational effectiveness and increasing cost efficiencies?

The bottom line is that the DoD recognizes that Joint operations are the way future conflicts will be fought; however, the back end has not changed. Program management of weapon systems has not been modernized and updated to establish the culture, leadership style, and organizational structures needed to achieve agile operations within a Joint management environment. A culture change is needed to successfully embrace the technology that is available and needed to address our current and future military challenges. The DoD cannot take 10 years, on average, to get new capability to the field. A single management structure provides a portfolio perspective and enables strategic management. Decisions regarding configuration control, interoperability, sustainment, and updates are done from a broader medium to high-altitude UAS fleet perspective versus an Air Force or Navy perspective.

Significance

This research paper is transformative in that it shows the benefits of a single program office managing the efforts of medium and high altitude UAS assets from a Joint perspective while employing agile principles versus the duplicative efforts currently being performed by the Air Force, Army, Navy, and Marines. A single UAS management office answers the GAO's frequent request for more efficient UAS management as well as aligning with the National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2017 vision to provide Joint force capabilities while implementing agile practices to meet requirements.[14] Following agile principles such as Boyd's OODA Loop,[15] creating a culture of unity and trust, and co-locating an appropriately skilled work force would better support Joint concepts than the

current approach. As the demand of and the need for ISR capability increases, the beneficial effects from this construct will continue to grow exponentially.[16]

The organizational structure proposed will reflect the agile principles of value and quality; while staying within the constraints of cost, schedule, and performance/scope.[17] The agile principle of "value" contains delivering product and continuous improvement; while the principle of "quality" contains reliable and adaptable product development, both of which would improve UAS ability to address emerging technology and threats.[18] A huge significance would be that the agile, Joint structure would support all stakeholders' needs and would act as a model to influence future cross-Service capability management.

Purpose of the Study

The purpose of this study is to explore how a single UAS program office could be a better fit with the current reality of the ever-growing demand for ISR, programmatic fiscal constraints, expanding Joint operations, and technology acquisition needing to get to the field faster. The long-standing belief that each Service needs to procure and manage assets needed for operational capability, even when another Service already possess that capability, should be abandoned. Joint mindedness includes relying on the other Services to supply operational capability. Especially when it comes to ISR, which is the air and life blood of all current and future operations. This research shows how a more agile and collaborative organizational structure will be more effective and efficient for the UAS ecosystem.

Research Question

With the goal being to eliminate duplicated capability, to make program management more efficient, and to increase the speed at which capability is delivered to the field; the research

question is **"**How could a single management office provide greater agility for unmanned aircraft systems (UAS); supporting Joint concepts, Joint operations and Joint interoperability?"

Definition of Terms

Adaptive Leadership Style. The unique leadership style required for enterprise agility to be implemented within an organization. This leadership style requires leaders to possess a certain mindset as well as certain things they need to be able to do. The leadership is creative, builds operating dexterity and reinvents customer service.[19]

Agile. Agility is the ability to both create and respond to change in order to profit in a turbulent business environment" per J. Highsmith, 2012.[20] It is the ability to balance both flexibility and stability or, in other words, balance process with innovation. In the context of this research paper, agility and adaptability are used within program management to achieve responsiveness to operational demands within the content of the identified constraints such as cost, schedule and performance/scope.

Fragmented program. As defined within the 2013 GAO Annual Report,[21] programs are considered fragmented when more than one organization within an agency works within the same broad area to national need.

ISR. Per Joint Publication 1-02, DoD Dictionary of Military and Associated Terms[22] - Intelligence, Surveillance, and Reconnaissance is "an activity that synchronizes and integrates the planning and operation of sensor, assets, and processing, exploitation, and dissemination systems in direct support of current and future operations."

Transformative. Is a worldview that advocates for some sort of political change. Historically, the change has to do with marginalized individuals or groups of people who are discriminated against. In this case, the transformative worldview is being used to advocate for a

more Joint management style between and among all of the Services. Capability acquisition and management should be viewed from the DoD level and not just the Service level.

Unmanned Aircraft Systems (UAS). "A system whose components include the necessary equipment, network, and personnel to control an unmanned aircraft."[23]

RESEARCH METHODOLOGY

The problem/solution framework was used, along with mixed methods for the data research[24] as it combined both quantitative and qualitative data to answer the problem proposed.[25] Actual program data was accumulated for each UAS system as the Status Quo; within each of the selected criteria. The quantitative data included product delivery, reliability, cost, and schedule criteria. The qualitative data included continuous improvement, adaptability and performance/scope criteria. Both the quantitative and qualitative data were converted to a numerical factor so that the data could be analyzed together.[26] Agile methodology (qualitative data) was then applied to each criteria by using estimated efficiencies gained from previous commercial and government efforts and converted to an equivalent rating scale as the Status Quo data. Alternative One was; therefore, a combination of the actual Status Quo data and the estimated efficiencies gained by applying agile methodology within the program and became the baseline for Alternatives Two and Three. This synergistic approach made both types of data to be of equal value and allowed agile theory and data analysis to work together.[27] By using agile methodology as criteria, this research can evaluate whether putting all medium and high altitude UAS assets under a single program office, managed using agile principles, could provide greater capability to the warfighter.

Consolidation cost efficiencies became an independent variable to the above and was not factored into the overall rating since there is no direct correlation to operational or

capability gain. Hence, the estimated savings are shown in dollars and will not be converted to a rating as the previous data was. These efficiencies are derived from consolidation efforts such as in Alternatives Two and Three. Estimates were calculated based upon specific consolidation findings from government consolidation efforts. Even though these savings are not directly attributable to operational or capability gain, they would provide a program office the ability to redirect those funds toward that goal.

ALTERNATIVE ANALYSIS CRITERIA

The selected criteria were used to evaluate the operational effectiveness of each of the management models described in alternatives two and three. Since ISR is reliant on being highly responsive, the chosen criteria were those used in organizations where the adaptive leadership style was employed to achieve enterprise agility.[28] There is a great deal of difference between this management style and what is traditionally found within the DoD. All aspects of adaptive leadership cannot be fully explored within the limits of this research; however, the selected criteria below represent the three points of the "Agile Triangle"[29] and are key to the management principles of enterprise agility. The primary goal of this model is to produce something that has value to your customer, that has quality built in, and that can outperform what is already in place, or provide for future enhancements. The constraints are the boundaries that the products must be delivered within.

Value[30]

The balance of product delivery and continuous improvement (along with speed) determine the value. Delivery and improvements are only valuable if the added capability is

actually used which means that in addition to need there also must be the training and culture shift to start using the new delivery.

1. **Product Delivery** – How long does it take the program office to deliver capability to the user? This is a key part of the agile framework. Deliver part of a product that has value versus waiting for a long time to get something that the operator can use to solve their problem.
2. **Continuous Improvement** – How long does it take the program office to deliver improvements to already delivered capability? Plan on delivering capability in smaller packages in a faster time frame but do it as a standard business practice and not as a separate effort. This is business as usual.

Quality[31]

As one of the three corners of the agile pyramid; it doesn't matter how often you deliver capability, if it doesn't operate correctly, it might not as well have been delivered.

3. **Reliability** – Did the program office deliver a product that operated correctly right now; both operationally and functionally?
4. **Adaptability** – Did the program office deliver a product that allows for changes so that it operates correctly tomorrow, both operationally and functionally?

Constraints[32]

These are the standard criteria by which most DoD programs have historically been judged. These are the three core responsibilities of the DoD Program Manager, regardless of platform or

Service. Within agile methodology, these are not the critical factors; instead they are value and quality. This is one of the central changes to implementing agility within a program.

5. **Cost** – Did the program office deliver the product on cost?
6. **Schedule** – Did the program office deliver the product on schedule?
7. **Performance/Scope** – Did the program office deliver the product within specifications?

DESCRIPTION OF ALTERNATIVES

Scope of Effort

The fleet of existing UAS are delineated into five different groups. This research effort will focus on groups four and five based upon their projected use in the President's Budget FY2013 through 2038. They are the medium and high altitude group of aircraft that are used for persistent and penetrating mission areas, respectively.

Alternative One - Status Quo (with possible improvements)

This alternative maintains the current practice of each Service managing their own assets. All of the existing program offices would stay in place. Data within each of the identified criteria were accumulated, and converted into a rating. Since it is possible for agile methodology to be employed within the current management structure, those improvements were identified and factored into the rating. The total of the current state and the improvements were used as a baseline and compared with the other two alternatives.

The following assets, identified by Service, are included in this study and will be used for all three alternatives:

United States Air Force

Group Four – MQ-1B Predator

Group Five – MQ-9 Reaper and RQ-4B Global Hawk

United States Navy / United States Marine Corps

Group Four – MQ-8B/C Fire Scout and RQ-7B Shadow

Group Five – MQ-4C Triton andX-47B UCAS

United States Army

Group Four – RQ-5 Hunter and MQ-1C Gray Eagle

Group Five– None

Alternative Two - Single Office within One of the Services

Within this alternative, the Group Four and Five UAS assets, identified above, are assigned to a single organization within one of the Services. The selection process for identifying which Service and which organization falls outside of the scope of this research effort. However, based upon past performance, the Navy and Marine Corps have shown strength in achieving fleet commonality, acquisition efficiencies, and developing open systems approach; where other Services have not. Additionally, the Navy and Marine Corps have assets in all three of these Groups; whereas, the Air Force and Army are each missing one Group. The synergies achieved via this alternative would be that of implementing agile methodology/philosophy, broader fleet perspective and uniform business practices. All Services should be represented regardless of which Service is selected to manage the UAS fleet. User involvement is paramount in developing requirements and achieving all of the criteria mentioned in this research. There are

many different ways this approach could be funded and managed while still maintaining the efficiency and effectiveness. Contracts can be structured to separate funding by source and to fairly derive cost shares. Implementing this alternative would be a phased approach in order to align with a variety of issues such as existing contracts, manpower and funding. The details of this approach is outside the scope for this research paper.

Alternative Three - New Unified Command

The nine Unified Commands are: United States Africa Command (USAFRICOM), United States Central Command (USCENTCOM), United States European Command (USEUCOM), United States Northern Command (USNORTHCOM), United States Pacific Command (USPACOM), United States Southern Command (USSOUTHCOM), United States Special Operations Command (USSOCOM), United States Strategic Command (USSTRATCOM), and United States Transportation Command (USTRANSCOM).

This alternative was selected because it fits within the definition of a unified command since it would be composed of significant assigned components from more than two Military Departments and are involved in a broad, continuing mission.[33] In this case, it would be organized on a functional basis; with command and control being performed in both peace and war, similar to USSOCOM. The growing demand for ISR delivered by these assets shows how critical these missions are to the military and the whole of government. If implemented, the scope would most likely become much broader than what is being covered within this paper but even within the limits of this research, there still are potentially much greater gains within this alternative over that of a single-Service management office.

Consolidation Cost Efficiencies

Within the commercial world as well as in the government, there have been many consolidation efforts to gain cost savings by eliminating fragmentation, overlap, and redundancy within organizations. The DoD has long recognized the costs associated with redundant locations which has been evidenced through the Defense Base Closure and Realignment Commission (BRAC) process. The Military Infrastructure Consolidation and Efficiency Act of 2016 continued this focus and required the DoD to look at requirements for potential base closures.[34] The Social Security Administration reported to Congress in FY2014 saying that the savings in rent, per facility, resulting from a consolidation was $25.02 per square foot (sf) and that the average facility reduction was 6,292sf. Therefore, the average savings in rent alone was $157,425.84/year for each consolidation.[35] In FY2012, the Internal Revenue Service consolidated 83 office spaces which saved approximately $6.6M[36] in rental expenses alone, averaging $79,518.07/year for each facility. Additionally, both of these consolidations eliminated the energy, equipment, and services that supported the work space generating even greater savings.

Managers at each of the consolidated locations performing financial, administrative, legal, security and contracting functions are reduced, making funds available for other functions that could create more efficiency. There will; however, still be a need for the majority of personnel from consolidated sites but even if the reduction is 10%, the cost savings would still be significant. The DoD has reported to the GAO that savings anywhere from 5 to 20 percent have been experienced when defragmenting acquisition approaches instead of contracting actions being performed at each of the program offices.[37] By centralizing contracting actions, strategic sourcing can be performed; whereby, larger

quantities would be procured at more favorable pricing instead of each Service contracting for a much smaller quantity. The GAO has reported that through contracting efficiency, spending would conservatively be reduced by at least 1%. For the purposes of this research, the costs found within Appendix B will be used to determine the 1% savings based upon the program office costs.

DISCUSSION ON FINDINGS

As noted in the Research Methodology section, actual data was used for Status Quo and estimates were used to account for agile methodology efficiencies. Rationale and calculations for each alternative are noted below within each section. Implementing agile principles within a program would be expected to produce as much as a 27% increase in effectiveness depending upon the extent agile principles, state of mind, culture, and processes are implemented.[38]

Since the focus of this research is on organizational structure and program management, each of the criteria will be focused on the skills, processes, state of mind, or culture of the program office needed to execute the outcome. For instance, the category "continuous improvement" within the "Value" criteria may list what improvements have been made to the system but the evaluation will be of those that enforced the process and instilled it within the culture. Such as within the MQ-4 system program office, there was a conscious effort to delay low rate initial production because the quality was in question. Instead of pressing on and producing a sub-par system, the management decided to delay and do more testing.[39] That action is seen as a positive position toward producing quality rather than strictly adhering to a schedule, regardless of the potential for delivery a poor quality product to the field.

Data for Alternative One - Status Quo (with possible improvements)

As stated before, a synergistic approach was taken where quantitative and qualitative data are viewed equally. The research data accumulated for the Value and Quality Criteria for this alternative can be found in Appendix A. The data accumulated for the Constraints Criteria can be found in Appendix B. The combined rating for the Status Quo plus the efficiencies gained from agile methodology being implemented become the baseline for Alternatives Two and Three.

Value Criteria for Alternative One – (See Table 1)

Delivery Criteria – There was sufficient data on all nine UAS systems to determine when the program started and when IOC was declared. Using data from Appendix A, the average time taken for programs to reach IOC was 10 years. Shown as a rating on a scale from 1 to 5, the average of 10 years, would be a 2.5 on the rating scale. Each year deviating from 10 years would equate to .5 on the scale. Therefore, 9 years would be 3 on the scale and 11 years would be 2.

Continuous Improvement Criteria- Shown as a rating on a scale from 1 to 5, with 1 being the least evolved program and 5 representing a program/community that has a state of mind within the culture to promote continuous improvement. This rating is based upon the data provided within Appendix A.

Possible Improvements - Evidence shows that as organizations implement agile practices and management principles, the likelihood of meeting their projects' original outcomes increases. A 2017 poll showed highly agility organizations increased meeting goals by approximately 27%.[40] Among those goals are delivering value and continuous improvement. Considering the degree of difficulty for each of these program offices to achieve a highly agile

program, the percentage being applied is 13.5% which is half of the optimum 27%. Therefore, two columns have been added to factor in an improved rating of 13.5% for each of the two categories.

These improvements would include new employees possessing a variety of skills so that they can be applied to different project management styles which would require agile training being part of each team member's continued development. Embedding users within the program management office and truly making them a critical member of the team helps to ensure quality and value are delivered. Senior leadership buy in is needed, along with an understanding of agile principles and management style that empowers this change and leads the way. Use of agile tools

Table 1 – Value Criteria for Alternative One

System	**Delivery Time to IOC**	**Added Agility +13.5%**	**Continuous Improvement**	**Added Agility + 13.5%**
MQ-1B (Predator)	11 years Rating 2.0	-1.5 years Rating 3.25	5	Rating 5
MQ-8B (Fire Scout)	10 years Rating 2.5	-1.35 years Rating 3.0	3	+.40 Rating 3.25
RQ-7B (Shadow)	8 years Rating 3.5	-1.08 years Rating 4.0	3	+.40 Rating 3.25
RQ-5 (Hunter)	13 years Rating 1.0	-1.75 years Rating 1.75	2	+.27 Rating 2.0
MQ-1C (Gray Eagle)	9 years Rating 3.0	-1.22 years Rating 3.5	5	Rating 5
MQ-9 (Reaper)	6 years Rating 4.5	-.81 years Rating 4.75	5	Rating 5
RQ-4B (Global Hawk)	12 years Rating 1.5	-1.62 years Rating 2.25	5	Rating 5
MQ-4C (Triton)	13 years Rating 1.0	-1.75 years Rating 1.75	4	+.54 Rating 4.25
X-47B (UCAS)	12 years Rating 1.5	-1.62 years Rating 2.25	2	+.27 Rating 2.0
Rating Sub-Total	**20.5**	**26.5**	**34**	**34.75**

to determine the appropriate acquisition approach on the continuum between agile and planned approaches, aids in the principles of continuous improvement and adaptability. The evolutionary acquisition approach delivers capability to the user sooner, empowers decisions to be made at the lowest level possible and uses a feedback, similar to the OODA loop, to readjust to new information from lessons learned. Of course, the waterfall approach is not eliminated within this continuum; however, it would now be but one of the tools within the tool box.

Quality Criteria for Alternative One – (See Table 2)

Reliability – Shown as a rating on a scale from 1 to 5, with 1 being the programs with a low level of reliability and unresolved issues. Programs that are proactive in addressing issues to increase reliability would be at the high rating of 5. The ratings will be based upon the information found within Appendix A.

Adaptability – This category covers the ability of the program's leadership to be adaptive in selecting how efforts are developed and executed as well as how responsive the product or team is to change.[41] The rating scale is from 1 to 5, with 1 being the programs with a low level of adaptability built within the system and 5 being those systems with a high level of adaptability. The ratings will be based upon the information found within Appendix A.

Possible Improvements – Within the Quality Criteria, reliability will not be given any improved rating due to implementing agile methodology. No evidence was found that supports agile methodology benefiting product reliability. However, there is evidence that agile methodology improves adaptability both within the program office as well as in product development. In fact, adaptability is key to agility in that all approaches are kept as choices in order to achieve a balance of speed, flexibility, stability and scale using incremental development

and delivery as its tool.[42] Considering the degree of difficulty for any program office within the DoD to achieve a highly agile program, the percentage being applied is 13.5% which is half of the optimum 27%. Therefore, a column has been added to factor in an improved rating of 13.5%.

Table 2 – Quality Criteria for Alternative One

System	Quality Reliability	Quality Adaptability	Added Agility +13.5%
MQ-1B (Predator)	1	5	5
MQ-8B (Fire Scout)	2	4	+.54 Rating 4.25
RQ-7B (Shadow)	2	2.5	+.34 Rating 2.5
RQ-5 (Hunter)	4	1	+.13 Rating 1.0
MQ-1C (Gray Eagle)	3	5	5
MQ-9 (Reaper)	5	5	5
RQ-4B (Global Hawk)	2	2	+.26 Rating 2.0
MQ-4C (Triton)	2.5	2.5	+.34 Rating 2.5
X-47B (UCAS)	5	2.5	+.34 Rating 2.5
Rating Sub-Total	**26.5**	**29.5**	**29.75**

Constraints Criteria – (See Table 3)

Cost – The cost data found in Appendix B for each of the systems covers the costs up to FY2013 and only includes what is listed; not the entire budget. Table 3 will be using the same scale from 1 to 5, with 2.5 being the score for all programs. The only deviations from 2.5 will be for programs who have breaches or have executed the program under the budget. The actual

costs for program management and engineering will be used later for determining consolidation cost efficiencies.

Schedule – The schedule data used for Table 3 comes from Appendix B. The rating scale used ranges from 1 to 5, with 3 being for the programs that are shown to be on schedule. The rating will go up or down based upon execution of program's original schedule.

Table 3 – Constraints Criteria for Alternative One

System	**Cost**	**Added Agility +13.5%**	**Schedule**	**Added Agility +13.5%**	**Performance/ Scope**	**Added Agility +13.5%**
MQ-1B (Predator)	2	+.26 Rating 2.0	3	+.40 Rating 3.25	2	+.26 Rating 2.0
MQ-8B (Fire Scout)	1.5	+.20 Rating 1.5	2	+.26 Rating 2.0	2	+.26 Rating 2.0
RQ-7B (Shadow)	3	+.40 Rating 3.25	5	5	4	+.54 Rating 4.25
RQ-5 (Hunter)	3	+.40 Rating 3.25	3	+.40 Rating 3.25	3	+.40 Rating 3.25
MQ-1C (Gray Eagle)	4	+.54 Rating 4.25	3	+.40 Rating 3.25	3	+.40 Rating 3.25
MQ-9 (Reaper)	3	+.40 Rating 3.25	4	+.54 Rating 4.25	3	+.40 Rating 3.25
RQ-4B (Global Hawk)	3	+.40 Rating 3.25	3	+.40 Rating 3.25	3	+.40 Rating 3.25
MQ-4C (Triton)	2	+.26 Rating 2.0	3	+.40 Rating 3.25	3	+.40 Rating 3.25
X-47B (UCAS)	1	+.13 Rating 1.0	1	+.13 Rating 1.0	3	+.40 Rating 3.25
Rating Sub-Total	**22.5**	**23.75**	**27.0**	**28.5**	**26.0**	**27.75**

Performance/Scope – The Performance/Scope data used for Table 3 comes from Appendix B. The rating scale used ranges from 1 to 5, with 3 being for the programs shown as meeting performance standards. The rating will go up or down based upon exceeding standards or not meeting those standards.

Possible Improvements – Same principles and rationale apply with all three of these criteria. Additional columns have been added to each; showing an adjustment of 13.5% adjustment for implementing agile methodology at the middle-level range.

Data for Alternative Two - Single Office within One of the Services

There are two different organizational models, both within the Air Force, that were considered for this alternative. One was the F-35 joint program office, and the other was AFLCMC/WLV, the Commercial Derivative Aircraft Division (CDAD) at Tinker AFB. Currently the F-35 joint program office only represents two Services, the Air Force and the Navy. Taking into consideration that all four Services will use the systems managed within this organization, the CDAD model was selected over the F-35 joint program office.

The CDAD at Tinker manages well over 40 aircraft Mission-Design Series (MDS) which is the common naming convention used since 1962 for weapon systems. What all of these MDS' have in common is that they are commercial derivative aircraft (CDA) and most of them are managed via Federal Aviation Administration (FAA) guidelines whenever possible. Deviations occur whenever non-commercial systems or parts are required for military purposes such as classified communications and for defensive measures. This organizational model was selected because it is a concentration of uniquely managed aircraft where specialized knowledge is needed to manage the programs efficiently. This is a culture

developed through training and experience where team members learn how to manage military aircraft via commercial practices so as to leverage the cost and technology benefits from the commercial supply chain.

As a Division, the systems are combined logically by mission type to create the branches and sections within the organization. The organizational structure supports efficiencies gained through similar users or aircraft type. Allocated to the Division are contracting officers, specialists, and buyers who are assigned to specific MDS' or are assigned to one of the overarching engineering support contracts with the original manufacturers. Additional efficiency is gained by having shared financial management, security, legal, contracting and administrative support. Since there is a great deal in common across the MDS, many of the overarching program documents can be standardized and applied to most of the programs within the Division. This seemingly insignificant thing amounts to a lot of time for the typical program. The centralized assets run interference for the program offices with the higher level agencies so that the program office is free to continue with the important program work. The same is true with the UAS ecosystem; they are unique within the Air Force and it takes training and time to master how to work within this environment totally. This model could be used, without many modifications, for the UAS medium to high-altitude fleet.

Value Criteria for Alternative Two - (see Table 4)

The same definitions and baseline data applied in Alternative One will be used for Alternative Two. The only change is implemented agile methodology will be at the full 27%.

Table 4: Value Criteria for Alternative Two

System	Delivery Time to IOC	Added Agility +27%	Continuous Improvement	Added Agility + 27%
MQ-1B (Predator)	11 years Rating 2.0	-3 years Rating 3.5	5	Rating 5
MQ-8B (Fire Scout)	10 years Rating 2.5	-2.70 years Rating 4.75	3	+.80 Rating 3.50
RQ-7B (Shadow)	8 years Rating 3.5	-2.16 years Rating 4.5	3	+.80 Rating 3.50
RQ-5 (Hunter)	13 years Rating 1.0	-3.50 years Rating 2.25	2	+.54 Rating 2.25
MQ-1C (Gray Eagle)	9 years Rating 3.0	-2.44 years Rating 4.25	5	Rating 5
MQ-9 (Reaper)	6 years Rating 4.5	-1.62 years Rating 5.0	5	Rating 5
RQ-4B (Global Hawk)	12 years Rating 1.5	-3.24 years Rating 2.75	5	Rating 5
MQ-4C (Triton)	13 years Rating 1.0	-3.5 years Rating 2.25	4	+1.08 Rating 4.50
X-47B (UCAS)	12 years Rating 1.5	-3.24 years Rating 3.00	2	+.54 Rating 2.25
Sub-Total	**20.5**	**32.25**	**34.0**	**36.0**

Quality Criteria for Alternative Two - (see Table 5)

The same definitions and baseline data applied in Alternative One will be used for Alternative Two. The only change is implemented agile methodology will be at the full 27%.

Table 5: Quality Criteria for Alternative Two

System	Quality Reliability	Quality Adaptability	Added Agility +27%
MQ-1B (Predator)	1	5	5
MQ-8B (Fire Scout)	2	4	+1.08 Rating 4.50
RQ-7B (Shadow)	2	2.5	+.68 Rating 2.75
RQ-5 (Hunter)	4	1	+.26 Rating 1.0
MQ-1C (Gray Eagle)	3	5	5
MQ-9 (Reaper)	5	5	5
RQ-4B (Global Hawk)	2	2	+.52 Rating 2.25
MQ-4C (Triton)	2.5	2.5	+.68 Rating 2.75
X-47B (UCAS)	5	2.5	+.68 Rating 2.75
Rating Sub-Total	**26.5**	**29.5**	**31.0**

Constraints Criteria for Alternative Two - (see Table 6)

The same definitions and baseline data applied in Alternative One will be used for Alternative Two. The only change is implemented agile methodology will be at the full 27%.

Table 6: Constraints Criteria for Alternative Two

System	**Cost**	**Added Agility +27%**	**Schedule**	**Added Agility +27%**	**Performance/ Scope**	**Added Agility +27%**
MQ-1B (Predator)	2	+.52 Rating 2.25	3	+.80 Rating 3.50	2	+.52 Rating 2.25
MQ-8B (Fire Scout)	1.5	+.40 Rating 1.75	2	+.52 Rating 2.25	2	+.52 Rating 2.25
RQ-7B (Shadow)	3	+.80 Rating 3.50	5	5	4	+1.08 Rating 4.50
RQ-5 (Hunter)	3	+.80 Rating 3.50	3	+.80 Rating 3.50	3	+.80 Rating 3.50
MQ-1C (Gray Eagle)	4	+1.08 Rating 4.50	3	+.80 Rating 3.50	3	+.80 Rating 3.50
MQ-9 (Reaper)	3	+.80 Rating 3.50	4	+1.08 Rating 4.50	3	+.80 Rating 3.50
RQ-4B (Global Hawk)	3	+.80 Rating 3.50	3	+.80 Rating 3.50	3	+.80 Rating 3.50
MQ-4C (Triton)	2	+.52 Rating 2.25	3	+.80 Rating 3.50	3	+.80 Rating 3.50
X-47B (UCAS)	1	+.26 Rating 1.0	1	+.26 Rating 1.0	3	+.80 Rating 3.50
Sub-Total	**22.5**	**25.75**	**27.0**	**30.25**	**26.0**	**30.0**

Data for Alternative Three – New Unified Command

The organizational model used for this alternative is USSOCOM that manages Special Operations Forces (SOF) worldwide. Since 1991, SOF acquisition, technology and logistics (AT&L) have been managed by the SOF AT&L Center; however, it is the USSOCOM Commander who has acquisition authority in addition to being the head of the agency. The USSOCOM Commander has delegated management and acquisition authority to SOF AT&L. Additionally, SOCOM has their own appropriation funding, Major Force Program-11, and their own streamlined acquisition authority which allows for more agile product acquisition in support of the SOF mission.[43]

In May 2017, General Raymond A. Thomas III gave his statement to the Senate Armed Services Committee and within his opening remarks, he gave a brief history on how and why SOCOM was developed which is the same as the situation today with UAS management across the DoD. Thirty years ago, The Goldwater Nichols Act and the Nunn-Cohen Amendment took individual Service specific SOF capabilities and turned it into USSOCOM. Gen Thomas went on to say that SOCOM has achieved their mission to provide highly effective Service-like and networked global functional Combatant Command of SOF.[44] This same outcome could be achieved for the medium to high altitude UAS feet as well.

Exploration of the SOF AT&L website (https://www.socom.mil/SOF-ATL/Pages/doing-business.aspx), shows a great deal of focus on partnering with industry and a great deal of accessibility between the acquisition program office and industry. As mentioned earlier, agility is a state of mind within a culture that promotes exactly this type of thinking. It is evident that within the SOF AT&L culture, agile thinking is a core principle.

Not only does USSOCOM have their own appropriation funding and streamlined acquisition authority but it also has a USSOCOM Acquisition Executive who is of like mind when it comes to agility and innovation. An example provided by the contracting office (SOF AT&L-K) within SOF AT&L, is that a normal timeline for other programs awarding a contract might be several weeks; whereas, SOF AT&L-K can turn it in a few days, if needed.[45] One of the things the team attributes this quick turn to is the fact that the approval authority is co-located with the contracting office and the program office.[46] Additionally, there is a lot of face-to-face communication and streamlined bureaucracy.

In addition to the streamlined decision making processes, the accessibility of the program office to industry, embedding users as part of the team, USSOCOM also takes risks by delivering 75% solutions versus 99% to get capability to the field sooner.[47] Other examples of streamlined delivery of capability are the Electronic Countermeasures team being able to develop, test and deliver 1200 upgrade kits in less than 9 months and the Stand-Off Precision Guided Munitions Quick Reaction Capability team fielding the first-of-a-kind SOF airborne weapon in less than 11 months.[48] Both of these examples are at least half the normal execution time of standard DoD acquisitions.

Based upon the examples provided, Alternative Three would provide greater agility then the 27% projected for Alternative 2 by approximately 23% for the delivery, continuous improvement and schedule criteria. In addition to greater agility, this alternative would provide the autonomy and warfighter perspective needed for strategic joint operational capability. Like SOCOM, this UAS Unified Command would be able to strategically address problems across any perceived boundaries, perform focused research, and establish critical relationships that would allow for a global perspective and strategy.

Value Criteria for Alternative Three - (see Table 7)

The same definitions and baseline data applied in Alternative One will be used for Alternative Two. The only change is implemented agile methodology will be at the full 27%.

Table 7: Value Criteria for Alternative Three

System	Delivery Time to IOC	Added Agility +50%	Continuous Improvement	Added Agility + 50%
MQ-1B (Predator)	11 years Rating 2.0	-5.5 years Rating 4.75	5	Rating 5
MQ-8B (Fire Scout)	10 years Rating 2.5	-5.0 years Rating 5.0	3	+1.5 Rating 4.25
RQ-7B (Shadow)	8 years Rating 3.5	-4.0 years Rating 5.0	3	+1.5 Rating 4.25
RQ-5 (Hunter)	13 years Rating 1.0	-6.5 years Rating 3.75	2	+1.0 Rating 2.50
MQ-1C (Gray Eagle)	9 years Rating 3.0	-4.5 years Rating 5.0	5	Rating 5
MQ-9 (Reaper)	6 years Rating 4.5	-3.0 years Rating 5.0	5	Rating 5
RQ-4B (Global Hawk)	12 years Rating 1.5	-6.0 years Rating 4.50	5	Rating 5
MQ-4C (Triton)	13 years Rating 1.0	-6.5 years Rating 3.75	4	+2.0 Rating 5
X-47B (UCAS)	12 years Rating 1.5	-6.0 years Rating 4.50	2	+1.0 Rating 2.50
Rating Sub-Total	**20.5**	**41.25**	**34**	**38.5**

Quality Criteria for Alternative Three - (see Table 8)

The same definitions and baseline data applied in Alternative One will be used for Alternative Two. The only change is implemented agile methodology will be at the full 27%.

Table 8: Quality Criteria for Alternative Three

System	Quality Reliability	Quality Adaptability	Added Agility +27%
MQ-1B (Predator)	1	5	5
MQ-8B (Fire Scout)	2	4	+1.08 Rating 4.50
RQ-7B (Shadow)	2	2.5	+.68 Rating 2.75
RQ-5 (Hunter)	4	1	+.26 Rating 1.0
MQ-1C (Gray Eagle)	3	5	5
MQ-9 (Reaper)	5	5	5
RQ-4B (Global Hawk)	2	2	+.52 Rating 2.25
MQ-4C (Triton)	2.5	2.5	+.68 Rating 2.75
X-47B (UCAS)	5	2.5	+.68 Rating 2.75
Rating Sub-Total	**26.5**	**29.5**	**31.0**

Constraints Criteria for Alternative Three - (see Table 9)

The same definitions and baseline data applied in Alternative One will be used for Alternative Two. The only change is implemented agile methodology will be at the full 27%.

Table 9: Constraints Criteria for Alternative Three

System	Cost	Added Agility +27%	Schedule	Added Agility +50%	Performance/ Scope	Added Agility +27%
MQ-1B (Predator)	2	+.52 Rating 2.25	3	+1.5 Rating 3.75	2	+.52 Rating 2.25
MQ-8B (Fire Scout)	1.5	+.40 Rating 1.75	2	+1.0 Rating 2.50	2	+.52 Rating 2.25
RQ-7B (Shadow)	3	+.80 Rating 3.50	5	5	4	+1.08 Rating 4.50
RQ-5 (Hunter)	3	+.80 Rating 3.50	3	+1.5 Rating 3.75	3	+.80 Rating 3.50
MQ-1C (Gray Eagle)	4	+1.08 Rating 4.50	3	+1.5 Rating 3.75	3	+.80 Rating 3.50
MQ-9 (Reaper)	3	+.80 Rating 3.50	4	+2.0 Rating 5.0	3	+.80 Rating 3.50
RQ-4B (Global Hawk)	3	+.80 Rating 3.50	3	+1.5 Rating 3.75	3	+.80 Rating 3.50
MQ-4C (Triton)	2	+.52 Rating 2.25	3	+1.5 Rating 3.75	3	+.80 Rating 3.50
X-47B (UCAS)	1	+.26 Rating 1.0	1	+.50 Rating 1.25	3	+.80 Rating 3.50
Rating Sub-Total	**22.5**	**25.75**	**27.0**	**32.5**	**26.0**	**30.0**

Data for Consolidation Cost Efficiencies

For more information on how formulas were derived for each category, see Description of Alternatives; Consolidation Cost Efficiencies section; reported in millions.

Facility/Rent – (see Table 10)

For purposes of this research, the assumption is that there is currently one office per Service for the Air Force, Army, Marines, and Navy. This assumption does not apply to Alternative One since no consolidation will be taking place. Alternative two and three propose a single office managing all of the efforts for the medium to high-altitude UAS fleets which means that three of the existing offices will be consolidated into the one. This would not consolidate or affect the maintenance facilities or supply chain management structure. In most cases, existing contracts and funding could be used by transferring to the new responsible organization. However, the detailed planning for the actual consolidation is outside the scope of this effort. The average savings for this, based upon the Social Security Administration and Internal Revenue Service example discussed in the Description of Alternatives section under Consolidation Cost Efficiencies, is $118,472 per year x 3 sites closing = $355,416 x 6 years across the FYDP = $2,132,496 for Alternative Two and Three.

Utilities – (see Table 10)

The same assumptions apply for this category as for facility/rent above. Based upon personal gas, electric, water and sewer costs, the estimated utilities savings is conservatively 5% of $355,416 (rent savings) = $17,771 x 6 years across the FYDP = $106,626 for Alternative Two and Three.

Manpower – (see Table 10)

The assumption made to estimate manpower savings was that there would be a 10% reduction in manning from the multiple program office structure to the new single program management model. Additional information regarding this assumption can be found with the

Description of Alternatives section under Consolidation Cost Efficiencies. It was further assumed that program offices being consolidated contained 20 people each and that the average cost per person was $200,000.00 a year, including benefits. Therefore, 20 x 10% = 2; 2 x $200,000 = $400,000; $400,000 x 3 = $1,200,000 x 6 = $7,200,000 across the FYDP for Alternative Two and Three.

Contracting – (see Table 10)

The efficiencies identified by previous efforts in the Description of Alternatives; Consolidation Cost Efficiencies section, range from 5 to 20 percent. For the purposes of this comparison, the average of 12.5% was used. If agile improvements are implemented within the existing multi-Service, multi-office Alternative One model, this efficiency can be achieved as well as in Alternative Two and Three. The contracting amounts used to calculate this savings, came from Appendix B, column one. Program costs, excluding travel, were totaled and used in this calculation; $103.92B x 12.5% = $12.99B. Granted, this is a rather large number but it equates to the savings for just the program management portion of the system from its inception through the FY2013 budget cycle.

Table 10: Consolidation Cost Efficiencies

Consolidation Cost Efficiencies				
Savings Categories	**Status Quo**	**Alternative One**	**Alternative Two**	**Alternative Three**
Facility/Rent	0	0	$ 2.1	$ 2.1
Utilities	0	0	$ .1	$ .1
Manpower	0	0	$ 7.2	$ 7.2
Contracting	0	$129.9	$129.9	$129.9
Savings Total	**0**	**$129.9**	**$139.3**	**$139.3**

Overview of the Data

Table 11, below, provides an overview of the data for all three alternatives plus the status quo rating without any agility improvements within the program offices. With the exception of reliability, all criteria improved going from Status Quo to Alternative One where agile methodology is employed and more improvement is seen going to Alternative Two where consolidation is happening. Going from Alternative Two to Three, there are only three criteria that are improved; however, the improvement is considerable resulting from the Unified Command approach. Alternative Three has the advantage over Alternative Two even with not being able to find data that directly links improvements in reliability, adaptability, cost and performance/scope back to the organizational model or agile principles. In order to further identify all of the gains, a more in-depth study of USSOCOM's data would be needed to be able to draw a clear comparison and to identify these additional efficiencies.

Table 11 Summary of Alternatives

Criteria	**Status Quo**	**Alternative One**	**Alternative Two**	**Alternative Three**
Delivery	20.50	26.50	32.25	41.25
Continuous Improvement	34.00	34.75	36.00	38.50
Reliability	26.50	26.50	26.50	26.50
Adaptability	29.50	29.75	31.00	31.00
Cost	22.50	23.75	25.75	25.75
Schedule	27.00	28.50	30.25	32.50
Performance/Scope	26.00	27.75	30.00	30.00
Rating Total	**186.00**	**197.50**	**211.75**	**225.50**

The same is true for Table 10, above, which shows that all three alternatives improved. Alternative One is shown with contracting efficiencies; however, this consolidation would not be of a physical nature. If the program offices all implemented agile methodology, an assumption was made that offices could coordinate their contracting actions to achieve more efficiency and synergy. Alternative Two and Three are equal in the cost efficiencies gained from the organizational consolidation.

CONCLUSIONS

Under Alternative One, individual program offices could become much more effective through implementing agile methodology at the operational level; however, this would be very difficult to implement across multiple program offices within different Services. Implementing such a transformative culture change requires senior leaders to be knowledgeable in agile methodology in order to lead the organization as well as extensive training of personnel. Even if an agile culture is achieve, an enterprise portfolio vision would not be and the UAS enterprise would continue to rely on the inconsistent success of the Task Force as the unifying agent. There would be minimal synergy among programs and no cost savings in core services.

Additionally, Alternative One does not move the DoD to a more joint-capable structure. Independent management, going all the way down to data, inhibits the enterprise view. An example, at the very heart of the military, is the status of logistics data within the current Service-specific environment. The DoD has no shortage of logistics data but they don't; however, have an efficient way to use it for effective decision making across multiple Services. The DoD got here by each Service making independent decisions, such as about logistics data management, as well as each program office, within each of the Services, doing that as well. This is a much larger problem than the boundaries of this research; however, it is a problem that must

be addressed. There are hundreds of logistics business systems supporting weapon systems but the data is stove piped. There are intricate processes, governance bodies requesting duplicative briefings and reports, regulations, and a lot of people at all levels attempting to address this issue but it stems from a lack of sharing between the Services. There is no fault in these circumstances because that was the model of our past but that model does not fit with the requirements of today. How do we get to the Joint DoD that is needed? The answer is with efforts such as this! Without an adaptive leader's vision to implement integrated, strategic management across all of the medium to high altitude UAS portfolio there will continue to be tension in achieving the joint nature of these UAS assets without duplicating capabilities and increasing costs.

Alternative Two and Three would satisfy the GAO's request for a single entity managing the medium to high altitude UAS assets. This would be done by employing agile methodology at the strategic level and by eliminating redundant core business services at multiple program offices.[49] This is caveated by saying that the organizational leadership would need to be empowered and adequately resourced to implement agile methodology.

Developing this new culture takes a strong, focused leader who can form a vision that aligns with enterprise strategic requirements while executing those requirements in a new way. A shift must be made from the rigid, traditional approach, to a more agile approach where decision making is quicker. However, the organization needs to be dynamic and recognize that not all efforts can be completed using the same methods. Many factors are weighed to determine what approach to take using tools such as the Boehm and Turner Agile Decision Tool[50] which is risk based but is different from the one standardly used. This decision tool includes worker skill levels, the stability of requirements, organizational culture, team size, and failure consequences to determine the acquisition approach taken on the continuum between agile and planned.

Alternative Three meets General Dempsey's challenge to look critically at ISR business processes to achieve the ISR Joint Force needed to maintain U.S. military advantage over our enemies. Table 10 shows this alternative providing more cost efficiencies from office consolidation and Table 11 shows that it offers greater program effectiveness across many of the agile methodology criteria.

Considering the ISR cross-domain,[51] universal nature of the data delivered, Alternative Three would offer a stronger voice to advocate for the UAS community and would acknowledge the current reality of Joint operations, fiscal constraints and needing to field technology faster. Furthermore, this alternative would provide greater alignment and consistency in sharing information, interfaces, and training across the entire portfolio. Decisions regarding configuration control, interoperability, sustainment, and updates will be done from a broader medium to high-altitude UAS fleet perspective versus a Service perspective. It will no longer take 10 years to get new capability to the field and there will be a portfolio perspective that enables strategic management.

RECOMMENDATIONS

Recommend that a more detailed DoD study take place to explore this option further. The gains estimated in this research are conservative and this author is reasonably sure that, if studied further, a much more favorable view would be gained of the Unified Command option.

Recommend that Alternative Three, following the USSOCOM model, be pursued as it would offer the medium to high-altitude UAS fleet the needed streamlined acquisition authority and agile methodology needed to meet the whole of government needs for ISR. This structure would meet efficiency demands for both funding and schedule as well as provide the warfighter perspective needed to maintain U.S. military advantage.

Appendix A – Value and Quality Criteria Data

	Value Product Delivery	Value Continuous Improvement	Quality Reliability	Quality Adaptability
Class 4 MQ-1B Predator Air Force	Stand up took from 1994 to 2002. First flight 1994; IOC 2005. Started in 2002 and in 2002 projected to phase out in 2025.[52]	Began the Culture and Process Improvement Program in 2015 to improve the quality of life issues for those working on the MQ-1B and MQ-9 programs.[53] Evolutionary acquisition to introduce improvements. Within operational community.[54]	Multiple Crashes - Mar 2016 due to a lost data link[55], Oct 2015 due to electronic systems failure due to lightning strike,[56] Apr 2008 due to failure of the throttle body,[57] Nov 2007,[58] and in Jan 2006.[59]	Evolutionary acquisition to introduce improvements.[60] Can be disassembled for deployment. Went from RQ to MQ designation as multi-role when Hellfire missiles added[61]
Class 4 MQ-8B/C Fire Scout Navy	Stand up took from 1999 to 2006. IOC in 2009. [62] Experienced a Nunn -McCurdy breach - MS C approved in 2007 was rescinded. [63]	There will be incremental integration of different mission payloads into the MQ-8 [64]	Operational testing performed in 2016 on radar, vehicle endurance, mission coverage, reliability of the system, operator workloads, and performance of the MQ-8C electro-optical/infrared sensor was not successful.[65]	Incremental integration allows for adaptability throughout the acquisition process. Rapid Deployment Capability can move faster than assessments can be made.[66]

	Value Product Delivery	Value Continuous Improvement	Quality Reliability	Quality Adaptability
Class 4 RQ-7B Shadow Marines	Stand up took from 1991 to 2002. First flight 1991 and IOC 2003. Started in 2003 and being phased out in 2030. [67]	During IOT&E, reliability was deemed insufficient due to target location errors. Has funded for several reliability efforts to replace the type of engine.[68]	Must be able to interact with F-35B to fulfill TACAIR functions. Must be able to share sensor IOI. Needs programmable software for cross cueing to create clear vision of fixed components.[69]	Standard
Class 4 RQ-5 Hunter Army	Stand up took from 1987 to 1995. First flight in 1991. Terminated in 1996. Restarted in 1999 and in 2002 planned to phase it out before 2015. [70]	Standard	Evidence of service from 1987 to 2005.[71]	Not suited for modern battlefield[72]
Class 4 MQ-1C Gray Eagle Army	Program started in 2005. Evolutionary acquisition used. IOC in 2014.[73]Accelerated delivery from 2 to 3 per year.[74]	Above average due to leadership embracing better buying power and constantly looking for ways to improve and be more efficient.[75]	Reliability issues related to software issues when sensors are added but once fixed, the issues do not reappear.[76]	Fuselage modification to allow for extended range. Has greater capability than expected. Modifications have been costly but system can accommodate.[77]

	Value Product Delivery	Value Continuous Improvement	Quality Reliability	Quality Adaptability
Class 5 MQ-9 Reaper Air Force	Stand up took from 2001 to 2006. IOC in 2007.[78] Delivery rose from 4 of the Predator to 48 per year of the Reaper in 2011. 2 years from purchase to delivery	Began the Culture and Process Improvement Program in 2015 to improve the quality of life issues for those working on the MQ-1B and MQ-9 programs.[79] Created engine trainer that expedites maintenance training.[80]	Significant funding for reliability and maintainability improvements to increase the mission capable rate and to reduce costs[81]	System can loiter 15 hours longer than other aircraft with its cap-abilities. The ability to defeat early warning threat radars, led to future packages including electronic attack, electronic support measures and communication features.[82]
Class 5 MQ-4C Triton Navy	Started in 2005. MS C delayed due to integration and software issues. Achieved MS C in 2016.[83]	The delay in low rate initial production did; however, allow for additional testing and for providing a better quality product.[84]	Due to system integration and software problems, the Navy delayed the first flight from May 2012 to May 2013.[85]	Standard
Class 5 X-47B UCAS Navy	In 2003 projected IOC to be before 2015 but was zeroed out in 2015.[86]	Standard	This was a Technology Readiness Level-6 effort to support Advanced Development[87]	Standard

Appendix B – Constraints Criteria Data

	Cost	Schedule	Performance/ Scope
Class 4 MQ-1B Predator Air Force	The budget did not discretely identify costs but rolled it under the developmental funding line of $9.870M. [88] Program Office: Unknown Engineering: Unknown Travel: Unknown Logistics: Unknown	On Schedule	Original procurement did not address data needs, requiring 2-year study beginning in 2015. Outcome was to make investment decisions with data-drive effectiveness assessments.[89]
Class 4 MQ-8B/C Fire Scout Navy	Nunn-McCurdy breach due to exceeding cost authority.[90] Costs for FY2011, 12, 13 Program Office: $20.370 Engineering: $106.047 Travel: $2.577 Logistics: $12.365 As of 2015, the re-scheduled program was within cost authority.[91]	Moved Full Rate Production from 2QFY2015 to 4QFY2012 - Went to Rapid Deployment Capability (RDC) initiatives. As of 2015, the program was having scheduling issues.[92]	A long list of fixes identified within the assessment process. As of 2015, the program was reporting to be within performance standards.[93]
Class 4 RQ-7B Shadow Marines	Program Office: $3.638 Engineering: $1.650 Travel: $0.0[94]	Program implemented a performance-based logistics contracting strategy with its prime contractor since 2003 resulting in availability at or above 90% - improved schedule. Depot repair time reduced, making aircraft more available and reducing schedule.[95]	Due to the implementation of PBL, performance has increased due to mishap rate being decreased.[96]

	Cost	Schedule	Performance/ Scope
Class 4 **MQ-1C** **Gray Eagle** **Army**	In 2012, reported to be under projected budget and meeting operational demands. Program Office: $46.094 Engineering: $197.118 Travel: Unknown[97]	All reporting of program shows schedule as green.	Operational testing showed performance at acceptable levels; however, human factors and training were lacking. There was a 2-hr, 191 checklist steps to start the GCS which should be streamlined. Overall simplify procedures and provide more control to the operators.[98]
Class 4 **RQ-5** **Hunter** **Army**	Program Office: Unknown Engineering: Unknown Travel: Unknown	On Schedule	Meets Performance Standards
Class 5 **MQ-9** **Reaper** **Air Force**	Program Office: $22.183 Engineering: $ Unknown Travel: $ Unknown Support: $72.366[99]	First aircraft delivered nearly one year earlier than projected.[100]	Meets Performance Standards
Class 5 **RQ-4B** **Global Hawk** **Air Force**	Program Office: $177.030 Engineering: Unknown Travel: Unknown Logistics: $21.181[101]	On Schedule	Meets Performance Standards
Class 5 **MQ-4C** **Triton** **Navy**	Program Office: Unknown Engineering: Unknown Travel: Unknown	On Schedule	Meets Performance Standards
Class 5 **X-47B** **UCAS** **Navy**	Navy estimating $3.7B for development through 2020; however, has not budgeted for this amount.[102] The program is unfunded. Program Office: $103.083 Engineering: $121.079 Travel: Unknown Support: $36.753[103]	First prototype landing July 2013, on the USS George H.W. Bush. FY2014 committed to develop, build and field aircraft but no formal program review until after the aircraft were fielded in 2020.[104]	Operational testing over a two-week period showed performance at acceptable levels onboard the USS Harry S. Truman.[105]

Endnote

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